

## Streamlined Copper WER: Review Checklist for July 2011 Testing

Permittee: Tyson Foods, Inc. (Grannis Facility) Permit No. AR0003018

Date reviewed: July 31, 2013 – August 2, 2013 Reviewer: Melinda McCoy, EPA R6

Questions	Yes	No	Comments
Date/Time sample collected?	X		July 5, 2011 (10 am, 11 am, noon, 1 pm)
Date/Time test initiated?	X		July 6, 2011 at 4:36 pm
Organism culture, hold, acclimation, feed, and handling protocols summarized?	X		See workplan and Table 5 of final report
Were the organisms acclimated to site water prior to initiating the test?		X	Not discussed, but considered optional per streamlined WER guidance (App A, B.2.)
If this is the 2 <sup>nd</sup> WER study, was it conducted at least four weeks after completion of the 1 <sup>st</sup> study?	n/a		This was the first round of WER testing.
Was upstream water unaffected by recent runoff events? Rainfall data should be included.	X		Rainfall data not included in WER report, but used <a href="http://www.wunderground.com">www.wunderground.com</a> to verify that precipitation data near DeQueen, AR showed no significant rainfall from June 20, 2011 to July 5, 2011. See EPA file titled "Rainfall_Jun20-Jul5.pdf."
Was the plant operating at "normal levels"? Flow data should be included.	X		Average of 4 effluent flow measurements was 0.3445 MGD which is approximately 40% of the permitted design flow of 0.864 MGD
Were samples stored at 0-4°C?	X		Chain-of-custody reports 2 deg C
Are chains-of-custody for samples included, accurate, and filled out completely?	X		
If chains-of-custody were not provided, were the sample dates and times provided?	n/a		Chain-of-custody provides sample date/time (see above).
Were analyses performed on the effluent that are normally required in the permit?	X		
If above question is yes, is the effluent sample representative of normal operations?	X		Yes, including DO (8.0 mg/L), pH (7.1), and TSS (<4 mg/L).
Were toxicity tests initiated w/in a maximum of 96 hours from the time of sample collection?	X		
If predators in the site water are a concern, was the site water filtered through a 37-60 µm sieve or screen?	n/a		Site water was 100% effluent.
Was the laboratory hard water made in accordance with appropriate guidelines?	X		Unclear from workplan or final report exact method used to prepare the moderately hard reconstituted lab water, but hardness, pH, and alkalinity appear appropriate for moderately hard water (see below).
Did the lab water have DOC, TOC, and TSS <5 mg/L as required?	X		DOC and TOC <1 mg/L and TSS <4 mg/L
Was the hardness of the lab water between the required 40 and 220 mg/L?	X		80 mg/L
Was the lab water hardness (w/in the above range) close to the site water?		X	Lab water 80 mg/L, Effluent 260 mg/L, but hardness normalization used in final calculations.
Are the lab water pH and alkalinity appropriate for the hardness used?	X		Yes, alkalinity (58 mg/L), hardness (80 mg/L), and pH (8.0) appear appropriate (based on Tables 7-8 on pages 33-34 of USEPA

			2002).
Was the spiking stock solution made from an appropriate reagent?	X		Copper sulfate
Was the same stock solution used for lab water and site water tests?	X		
Was the test conducted using <i>Ceriodaphnia dubia</i> or <i>Daphnia magna</i> ?	X		<i>C. dubia</i>
If “no” to the above question, was an adequate Species Mean Acute Value (SMAV) provided for the species used?	n/a		
Were test initiation dates and times provided?	X		July 6, 2011 at 4:36 pm
Were test termination dates and times provided?	X		July 8, 2011 at 5:10 pm
Was a static test run?	X		
If “yes” to the above question, did the dissolved oxygen level remain acceptable throughout the entire test?	X		
If a static test was run, did the dissolved copper concentration at the end of 48 hours decrease by more than 50% from test initiation?		X	
Did it increase by more than 10% from test initiation?		X	
Was a range finder test conducted?	X		
Was the dilution factor used in the definitive tests of 0.6 or greater?	X		dilution series of 6.5
Was an unspiked dilution water control for each test used?	X		
Were at least 20 test organisms per treatment used?	X		20
Were two or more replicates used per treatment?	X		4
Were randomization procedures utilized?	?	?	Not addressed in workplan or final report
Were the site water and lab water prepared in accordance with the appropriate guidance document?	X		Workplan and final report do not get into very much detail about preparation of lab or site water. More details regarding spiking are provided and appear appropriate.
Were hardness, pH, alkalinity, TSS, and DOC measured at test initiation for both site water and lab water?	X		
Were dissolved oxygen, pH, and temperature measured for each treatment at the appropriate times during the test?	X		DO and pH results were reported on the lab sheets, but not temperature. However, the workplan and final report says that temperature was measured during each WER test (see Footnote 1, Table 4 of final report).
Was total copper measured?	X		
Was dissolved copper measured?	X		
Were summary tables provided containing copper concentrations and organism response for each concentration?	X		
Were an explanation of “unusual” observations and any procedural deviations provided if necessary?	n/a		nothing unusual was reported
Indicate in the comments section which of the measurements for the two questions above were used in calculating the WER?			Dissolved and total WERs were determined in July 2011 and September 2011, but the final WER used the dissolved copper WERs.

Were the copper concentrations measured at the appropriate frequency, according to the guidance document, for dissolved or total recoverable copper?	X		At test initiation and termination for both dissolved and total.
Was the hardness normalized according to the guidance document?	X		Yes, see EPA spreadsheet titled "Tyson Grannis-H Normalization Calcs.xls"
Were the LC50 values calculated appropriately?	X		Yes, see EPA document titled "Review of LC50s and WERs for July 2011.doc" and EPA spreadsheets titled "...LC50 check...xls". In each spreadsheet, perform the following steps. 1. Go to worksheet labeled "Input" or "Input2". 2. Click on "Calculate Result" button. 3. Click on "View" tab at top of screen. 4. Click on "Macros." 5. Scroll down to highlight "TabsShow." 6. Click "Run." 7. View Spearman-Kärber LC50 on worksheet labeled "Spearman-Kärber."
Was the final study WER calculated appropriately in accordance with the guidance document?	X		<b>Total WER for July 2011 = 3.12</b> <b>Dissolved WER for July 2011 = 2.90</b>
Did the test meet acceptability requirements?	X		Site Water – Yes  Lab Water – Mostly yes. Only exception was that no other treatment (other than control) had at least 50% survival. However, in the end, the SMAV (rather than lab water LC50) was used in calculating the July 2011 WER.

## Streamlined Copper WER: Review Checklist for September 2011 Testing

Permittee: Tyson Foods, Inc. (Grannis Facility) Permit No. AR0003018

Date reviewed: August 5, 2013 Reviewer: Melinda McCoy, EPA R6

Questions	Yes	No	Comments
Date/Time sample collected?	X		September 6, 2011 (10am, 11am, noon, 1pm)
Date/Time test initiated?	X		September 7, 2011 at 3:59 pm
Organism culture, hold, acclimation, feed, and handling protocols summarized?	X		See workplan and Table 5 of final report
Were the organisms acclimated to site water prior to initiating the test?		X	Not discussed, but considered optional per streamlined WER guidance (App A, B.2.)
If this is the 2 <sup>nd</sup> WER study, was it conducted at least four weeks after completion of the 1 <sup>st</sup> study?	X		
Was upstream water unaffected by recent runoff events? Rainfall data should be included.	X		Rainfall data not included in WER report, but used <a href="http://www.wunderground.com">www.wunderground.com</a> to locate precipitation data near DeQueen, AR. There does appear to have been a thunderstorm on August 29, 2013, (0.37 in precipitation), but this occurred 8 days before sampling. See EPA file titled "Rainfall_Aug21-Sept6.pdf."
Was the plant operating at "normal levels"? Flow data should be included.	X		Average of 4 effluent flow measurements was 0.3222 MGD which is approximately 37% of the permitted design flow of 0.864 MGD
Were samples stored at 0-4°C?	X		Chain-of-custody reports 2 deg C
Are chains-of-custody for samples included, accurate, and filled out completely?	X		
If chains-of-custody were not provided, were the sample dates and times provided?	n/a		Chain-of-custody provides sample date/time (see above).
Were analyses performed on the effluent that are normally required in the permit?	X		
If above question is yes, is the effluent sample representative of normal operations?	X		Yes, including DO (8.2 mg/L), pH (7.8), and TSS (<4 mg/L).
Were toxicity tests initiated w/in a maximum of 96 hours from the time of sample collection?	X		
If predators in the site water are a concern, was the site water filtered through a 37-60 µm sieve or screen?	n/a		Site water was 100% effluent.
Was the laboratory hard water made in accordance with appropriate guidelines?	X		Unclear from workplan or final report exact method used to prepare the moderately hard reconstituted lab water, but hardness, pH, and alkalinity (as reported in Table 6 of final report) appear appropriate for moderately hard water (see below). (Note: could not verify site water hardness or lab water alkalinity and hardness from the analytical results tables in Appendix C.)
Did the lab water have DOC, TOC, and TSS <5 mg/L as required?	X		DOC and TOC <1 mg/L and TSS <4 mg/L
Was the hardness of the lab water between the required 40 and 220 mg/L?	X		82 mg/L (Note: could not verify this value from analytical results tables in Appendix C)

Was the lab water hardness (w/in the above range) close to the site water?		X	Table 6 of final report identifies lab water hardness of 82 mg/L and effluent hardness of 190, but hardness normalization used in final calculations. <i>See notes above about hardness value verification.</i>
Are the lab water pH and alkalinity appropriate for the hardness used?	X		Based on values identified in Table 6 of final report, response would be yes. Alkalinity (58 mg/L), hardness (82 mg/L), and pH (8.2) appear appropriate (based on Tables 7-8 on pages 33-34 of USEPA 2002).
Was the spiking stock solution made from an appropriate reagent?	X		Copper sulfate
Was the same stock solution used for lab water and site water tests?	X		
Was the test conducted using <i>Ceriodaphnia dubia</i> or <i>Daphnia magna</i> ?	X		<i>C. dubia</i>
If “no” to the above question, was an adequate Species Mean Acute Value (SMAV) provided for the species used?	n/a		
Were test initiation dates and times provided?	X		September 7, 2011 at 3:59 pm
Were test termination dates and times provided?	X		September 9, 2011 at 3:05 pm
Was a static test run?	X		
If “yes” to the above question, did the dissolved oxygen level remain acceptable throughout the entire test?	X		
If a static test was run, did the dissolved copper concentration at the end of 48 hours decrease by more than 50% from test initiation?	X		Yes, but only in the site water unspiked sample. LC50 was the same whether or not this dose/response was included in the LC50 calculations.
Did it increase by more than 10% from test initiation?		X	
Was a range finder test conducted?	X		
Was the dilution factor used in the definitive tests of 0.6 or greater?	X		dilution series of 6.5
Was an unspiked dilution water control for each test used?	X		
Were at least 20 test organisms per treatment used?	X		20
Were two or more replicates used per treatment?	X		4
Were randomization procedures utilized?	?	?	Not addressed in workplan or final report
Were the site water and lab water prepared in accordance with the appropriate guidance document?	X		Workplan and final report do not get into very much detail about preparation of lab or site water. More details regarding spiking are provided and appear appropriate.
Were hardness, pH, alkalinity, TSS, and DOC measured at test initiation for both site water and lab water?	X		Yes, according to Table 6 of the final report. <i>However, note that could not verify site water hardness or lab water alkalinity and hardness from the analytical results tables in Appendix C.</i>
Were dissolved oxygen, pH, and temperature measured for each treatment at the appropriate times during the test?	X		DO and pH results were reported on the lab sheets, but not temperature. However, the workplan and final report says that temperature was measured during each WER test (see Footnote 1, Table 4 of final report).

Was total copper measured?	X		
Was dissolved copper measured?	X		
Were summary tables provided containing copper concentrations and organism response for each concentration?	X		
Were an explanation of “unusual” observations and any procedural deviations provided if necessary?	n/a		nothing unusual was reported
Indicate in the comments section which of the measurements for the two questions above were used in calculating the WER?			Dissolved and total WERs were determined in July 2011 and September 2011, but the final WER used the dissolved copper WERs.
Were the copper concentrations measured at the appropriate frequency, according to the guidance document, for dissolved or total recoverable copper?	X		At test initiation and termination for both dissolved and total.
Was the hardness normalized according to the guidance document?	X		Yes, see EPA spreadsheet titled “Tyson Grannis-H Normalization Calcs.xls”
Were the LC50 values calculated appropriately?	X		Yes, see EPA spreadsheets titled “...LC50 check...xls”. In each spreadsheet, perform the following steps. 1. Go to worksheet labeled “Input” or “Input2”. 2. Click on “Calculate Result” button. 3. Click on “View” tab at top of screen. 4. Click on “Macros.” 5. Scroll down to highlight “TabsShow.” 6. Click “Run.” 7. View Spearman-Kärber LC50 on worksheet labeled “Spearman-Kärber.”
Was the final study WER calculated appropriately in accordance with the guidance document?	X		<b>Total WER for Sept 2011 = 5.31</b> <b>Dissolved WER for Sept 2011 = 5.13</b>
Did the test meet acceptability requirements?	X		Site Water – Mostly yes. The only exception was that the dissolved copper concentration in the site water unspiked sample decreased by more than 50% between test initiation and termination. However, the LC50 was the same whether or not this dose/response was included in the LC50 calculations.  Lab Water – yes.

## Streamlined Copper WER: Final Study Review Checklist

Permittee: Tyson Foods, Inc. (Grannis Facility) Permit No. AR0003018

Date reviewed: August 5, 2013 Reviewer: Melinda McCoy, EPA R6

Questions	Yes	No	Comments
Were any individual studies eliminated from consideration in the final WER calculation? If yes, provide an explanation.		X	The dissolved WER from each study was used to calculate the final WER.
Was the final WER calculated as the geometric mean of two (or more) samples?	X		Final WER = 3.86
Does the final WER value "seem" acceptable? If no, explain why in the comments section?	X		Yes, pending the verification of site water hardness and lab water hardness and alkalinity in the September 2011 tests.
Were acute and chronic criteria calculated? If yes, provide the results in the comments section.		X	No, but would be -- Acute: $5.64 \text{ ug/L} \times 3.86 = 21.77 \text{ ug/L}$ Chronic: $4.17 \times 3.86 = 16.10 \text{ ug/L}$
Did the test meet acceptability requirements?	X		See notes above for July 2011 and Sept 2011 and see below.
Were greater than 10% of control organisms adversely affected?		X	
For lab water, at least one treatment showed at least 50% of the organisms to be adversely affected?	X		Note: In both July and Sept 2011, SMAV used instead of lab water LC50.
For site water, at least one treatment showed at least 63% of the organisms to be adversely affected?	X		
Did a lower concentration kill a higher % of orgs than a higher concentration? If so, did this occur for more than 2 concentrations affecting btwn. 20-80% of orgs?		X	
Are the WERs obtained with the primary and secondary tests w/in a factor of 3? If yes, then results are further confirmed.	X		
Does the test with the higher endpoint give the higher WER? If yes, then results are further confirmed.	X		

**Tyson Foods, Inc.**  
**Grannis Facility (AR0003018) Water Effect Ratio Study**

**Overall Conclusions:**

**July 2011:**

The total and dissolved WERs of 3.12 and 2.90, respectively, for July 2011 are technically acceptable.

**September 2011:**

The only value for site water hardness available in the analytical results from American Interplex Corporation Laboratories (see Appendix C of the WER final report) was a hardness of 280 mg/L, not 190 mg/L as reported in Table 6 of the WER final report. Also, results for lab water hardness and alkalinity were not available in the analytical results from American Interplex (see Appendix C of the WER final report). For this reason, the lab water hardness and alkalinity reported in Table 6 of the final report (82 mg/L and 58 mg/L, respectively) cannot be verified.

It is very important to verify the site water hardness and lab water alkalinity and hardness. Hardness values are especially important to verify, since they can affect the WER calculations (via the hardness normalization process). For example, if the site water hardness was in fact 280 mg/L (not 190 mg/L), then the WERs for September 2011 would be more stringent, with a total WER of 3.68 and a dissolved WER of 3.56.

**If** it can be verified that the site water hardness was in fact 190 mg/L, the lab water hardness was 82 mg/L, and the lab water alkalinity was 58 mg/L, **then** the total and dissolved WERs of 5.31 and 5.13, respectively, for September 2011 are technically acceptable. One way to verify this would be to provide the analytical results from American Interplex showing the site water hardness of 190 mg/L, lab water hardness of 82 mg/L, and lab water alkalinity of 58 mg/L.

If the hardness values are not 190 mg/L and 82 mg/L, for site water and lab water, respectively, then the September 2011 total and dissolved WERs will need to be revised appropriately (based on revised hardness normalization calculations that reflect the actual hardness of the site water and lab water). The final total and dissolved WERs (based on WERs from July and September 2011) would, in turn, also need to be revised if the September WERs were revised.

**Additional Comments:**

*Note that the final WER study for the Grannis facility does NOT need to be revised to address the additional comments below. However, based on the review of the Grannis WER study, the comments below are offered as reminders on additional items to be sure to address in any other future copper streamlined WER studies completed by ADEQ or third parties.*

- Test organism acclimation protocols should be addressed in future WER workplans/reports (see Copper Streamlined WER Guidance, Appendix A, Section B).
- Include meteorological data (streamflow or rainfall) data in future WER reports (see Copper Streamlined WER Guidance, Appendix A, Section C.6). Note that for the Grannis WER study, the workplan committed to providing rainfall data, but the final report did not provide the data.
- Describe lab water preparation procedures (e.g., procedures used to prepare the moderately hard lab water) in future WER workplans/reports (see Copper Streamlined WER Guidance, Appendix A, Section D.1).
- Randomization protocols should be addressed in future WER workplans/reports (see Copper Streamlined WER Guidance, Appendix A, Section E.13).
- Include test temperature data in future WER reports (see Copper Streamlined WER Guidance, Appendix A, Section F.3). Note that for the Grannis WER study, the workplan and final report state that temperature was measured during each WER test (see Footnote 1, Table 4 of final report); however, temperature data were not included in the data sheets from American Interplex (dissolved oxygen and pH data were provided).
- Ensure that the copper concentrations used to perform LC50 calculations (e.g., those values used in the Probit/Spearman-Kärber analyses) and the copper concentrations described in the analytical results report from the lab are the same. For the Grannis WER study, it appears that there were minor rounding differences between these two sources in this WER study (e.g., see concentrations reported in Tables 8 and 9 of the WER final report versus the analytical results reported in the July and September 2011 lab reports in Appendix C of the WER final report).
- In the WER final report, present the revised site-specific criteria based on the final WER(s) calculated for the site.